

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:
  - a semiconductor substrate;
  - a capacitor structure formed above the
  - 5 semiconductor substrate and comprising
    - a first electrode,
    - a second electrode provided below the first
    - electrode,
    - a third electrode provided below the second
    - 10 electrode,
    - a first dielectric film provided between the first
    - electrode and the second electrode, and
    - a second dielectric film provided between the
    - second electrode and the third electrode;
    - 15 an insulating film covering the capacitor
    - structure and having a first hole reaching the first
    - electrode, a second hole reaching the second electrode,
    - and a third hole reaching the third electrode;
    - a first conductive connection electrically
    - 20 connecting the first electrode and the third electrode
    - and having portions buried in the first and third
    - holes; and
    - a second conductive connection formed separately
    - from the first conductive connection and having a
    - 25 portion buried in the second hole.
2. The semiconductor device according to claim 1,  
wherein

an outer end of the second electrode is positioned outside the first electrode in a direction parallel to a main surface of the semiconductor substrate; and

an outer end of the third electrode is positioned  
5 outside the second electrode in a direction parallel to the main surface of the semiconductor substrate.

3. The semiconductor device according to claim 1, further comprising a ring-shape electrode surrounding the first electrode.

10 4. The semiconductor device according to claim 3, wherein an outer end of the first dielectric film and an outer end of the second electrode are aligned with an outer end of the ring-shape electrode.

5. The semiconductor device according to claim 4,  
15 wherein an outer end of the third electrode is aligned with an outer end of the second dielectric film.

6. The semiconductor device according to claim 1, wherein the first, second, and third electrodes are formed of the same material.

20 7. The semiconductor device according to claim 1, wherein the first and second dielectric films are formed of the same material.

8. The semiconductor device according to claim 1, wherein the capacitor structure further comprises  
25 a fourth electrode provided below the third electrode and a third dielectric film provided between the third electrode and fourth electrode; the insulating film

further has a fourth hole reaching the fourth electrode; and the second conductive connection further has a portion buried in the fourth hole.

5       9. The semiconductor device according to claim 8, wherein the capacitor structure further comprises a fifth electrode provided below the fourth electrode and a fourth dielectric film provided between the fourth electrode and fifth electrode; the insulating film further has a fifth hole reaching the fifth  
10       electrode, and the first conductive connection further has a portion buried in the fifth hole.

15       10. The semiconductor device according to claim 1, further comprising a wiring metal layer provided between the semiconductor substrate and the capacitor structure.

11. A method of manufacturing a semiconductor device, comprising:

forming a stacked film above a semiconductor substrate, the stacked film comprising a first  
20       conductive film, a second conductive film provided below the first conductive film, a third conductive film provided below the second conductive film, a first dielectric film provided between the first conductive film and the second conductive film, and a second  
25       dielectric film provided between the second conductive film and third conductive film;

forming a capacitor structure comprising a first

electrode formed of the first conductive film, a second electrode formed of the second conductive film, and a third electrode formed of the third conductive film by patterning the stacked film;

5           forming an insulating film covering the capacitor structure and having a first hole reaching the first electrode, a second hole reaching the second electrode and a third hole reaching the third electrode; and

          forming a first conductive connection electrically  
10       connecting the first electrode and the third electrode and having portions buried in the first and third holes, and a second conductive connection formed separately from the first conductive connection and having a portion buried in the second hole.

15           12. The method according to claim 11, wherein forming the capacitor structure comprises:

          patterning the first conductive film to form the first electrode and a ring-shape conductive portion surrounding the first electrode;

20           forming a mask pattern covering the first electrode and a part of the ring-shape conductive portion;

          patterning the first dielectric film with the ring-shape conductive portion and the mask pattern used  
25       as a mask;

          patterning the ring-shape conductive portion with the mask pattern used as a mask to form a ring-shape

electrode; and

    patterning the second conductive film with the  
patterned first dielectric film used as a mask.

13. The method according to claim 12, wherein  
5 forming the capacitor structure further comprises:

    further patterning the patterned first dielectric  
film with the mask pattern used as a mask;

    patterning the second dielectric film with the  
patterned second conductive film used as a mask;

10 further patterning the patterned second conductive  
film with the mask pattern used as a mask to form  
a second electrode; and

    patterning the third conductive film with the  
patterned second dielectric film used as a mask to form  
15 a third electrode.

14. The method according to claim 11, wherein the  
first, second and third electrodes are formed of the  
same material.

15. The method according to claim 11, wherein the  
20 first and second dielectric films are formed of the  
same material.